Pilot Fatigue – A Study on the Effectiveness of Flight & Duty Time Regulations for Professional Pilots in Canada

by Me René David-Cooper

Abstract

This report summarizes the findings of a study conducted in 2016-2017, which analyzed the effectiveness of flight and duty time (FDT) regulations for professional pilots in Canada. With air carriers operating across the world, twenty-four hours a day, 365 days a year, pilots must fly day and night, while being responsible for the lives of their passengers and aircrew.

Consequently, federal regulations in Canada govern the maximum FDT a pilot may fly an aircraft (flight time), and be on duty at his or her workplace (duty time). While many Members States of the International Civil Aviation Organization (ICAO) have recently modernised their FDT regulations, Canada's regulatory approach to mitigate pilot fatigue has not been updated since 1996.

This study focused on Canadian operators conducting commercial operations under Part VII of the *Canadian Aviation Regulations* (CARs) as 702, 703, 704 and 705 operators. It analyzed whether federal laws adequately regulate pilot fatigue and if there are some gaps within the CARs. Because the CARs regulate FDT differently depending on the category of operator, this study also considered potential safety trends with respect to pilot fatigue in various categories of carriers; the effects of standby duty and being awake for extended periods of time; and whether less-experienced pilots are more vulnerable to pilot fatigue in comparison with more experienced pilots.

Five key informants, who worked as professional pilots in Canada, were interviewed in the course of this study to substantiate certain hypotheses. Following these interviews, this report was produced. It focuses on five aspects of FDT regulations in order to understand their positive or adverse impact on pilot fatigue: (1) work schedules; (2) pilot remuneration; (3) fatigue and stress; (4) company safety culture and work environment; and (5) industry issues.

Canada Research Chair on Occupational Health and Safety – University of Ottawa

On the Move Partnership

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Introduction

In 2016, a research paper was written by René David-Cooper[1] under the supervision of Professor Katherine Lippel (University of Ottawa) on the topic of flight and duty time (FTD) regulations in Canada. The Institute of Air & Space Law at McGill University later published this paper in the form of a journal article ("Protecting the Health and Safety of Pilots: A Critical Analysis of Flight and Duty Time Regulations in Canada").[2]

With new FDT regulations scheduled to come into effect in Canada, a study on the effectiveness of FDT regulations for professional pilots in Canada was launched to look into the practical aspects of pilot fatigue in connection with the current regulatory framework. In order to ensure a full understanding of the issues and technical aspects surrounding FDT regulations in Canada, this report should be read along with the above-mentioned journal article.

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Research Objectives

This study was launched to understand and analyze the effectiveness of flight and duty time regulations for professional pilots in Canada. Depending on the type of operator, federal regulations govern the maximum FDT (see **Appendices 1 and 2**) a pilot may fly an aircraft (flight time) and be on duty at his or her workplace in a given period (duty time). However, Transport Canada and the Transportation Safety Board of Canada have highlighted the adverse effects of

[1] René David-Cooper, J.D. LL.L. (Ottawa); LL.M. (McGill), Member of the Law Society of Upper Canada and licensed Commercial Pilot (CPL).
[2] René David-Cooper, "Protecting the Health and Safety of Pilots: A Critical Analysis of Flight and Duty Time Regulations in Canada" (2016) XLI Annals of Air and Space Law 81.

pilot fatigue[4] – a phenomenon that endangers the health and safety of passengers and flight crews worldwide.

[4] See for instance: [4] Transport Canada, "Regulations Amending the Canadian Aviation Regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods)", (6 January 2017), online: *Can Gaz* <http://www.gazette.gc.ca/rp-pr/p1/2017/2017-07-01/html/reg2-eng.html>. Transportation Safety Board of Canada, "Aviation Investigation Report A12W000, Runway Overrun, 1263343 Alberta Inc. (DBA Enerjet) Boeing 737-700, C-GDEJ, Fort Nelso, British Columbia, 09 January 2012", (6 August 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2012/a12w0004/a12w0004.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report A08C0164, Airspeed Decay – Uncommanded Descent, Air Canada Jazz, Bombardier CRJ 705, C-FNJZ, Winnipeg, Manitoba, 180 nm SE, 01 August 2008", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2008/a08c0164/a08c0164.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report A00W0217, Collision with Terrain, Summit Air Charters Ltd., Short Brothers SC-7 Skyvan C-FSDZ, Port Radium, Northwest Territories, 08 October 2000", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2000/a00w0217/a00w0217.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report A08W0244, Controlled Flight into Terrain, Summit Air Charters Limited, Dornier 228-202 C-FYEV, Cambridge Bay, Nunavut, 13 December 2008", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2008/a08w0244/a08w0244.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report, Runway Overrun, Trans States Airlines LLC, Embraer EMB-145LR N847HK, Ottawa/MacDonald-Cartier International Airport, Ontario, 16 June 2010, Report Number A10H0004", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2010/a10h0004/a10h0004.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report, Controlled Flight into Terrain, Provincial Airlines Limited, de Havilland DHC-6-300 Twin Otter C-FWLQ, Davis Inlet, Newfoundland 2 nm NNE, 19 March 1999, Report Number A99A0036", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/1999/a99a0036/a99a0036.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report A11F0012, Pitch Excursion, Air Canada, BOEING 767-333, C-GHLQ, North Atlantic Ocean, 55°00'N 029°00'W, 14 January 2011", (24 April 2013), online:; Transportation Safety Board of Canada, "Aviation Occurrence Report A93W0204, Engine Power Loss/ Loss of Control, Arctic Wings and Rotors, Pilatus Britten-Norman BN2A-20 Islander, C-GMOP, Tuktoyaktuk, Northwest Territories 7.7 mi SE, 03 December 1993", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/1993/a93w0204/a93w0204.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report A09P0187, Wake Turbulence Encounter - Collision with Terrain, Integra Ops Ltd. (dba Canadian Air Charters), Piper PA-31-350 Chieftain, C-GNAF, Richmond, British Columbia, 09 July 2009", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2009/a09p0187/a09p0187.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report, Controlled Flight Into Terrain, Régionnair Inc., Raytheon Beech 1900D C-FLIH, Sept-Îles, Quebec, 12 August 1999, Report Number A99Q0151", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/1999/a99q0151/a99q0151.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report, Collision With Terrain, Northern Mountain Helicopters Inc., Bell 206B (Helicopter) C-GVQK, Bear Valley, British Columbia, 30 July 1997, Report Number A97P0207", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/1997/a97p0207/a97p0207.pdf>; Transportation Safety Board of Canada, "Aviation Investigation Report, Controlled Flight into Terrain, Cessna 182 D-EDOG, Timmins, Ontario, 03 August 2001, Report Number A01O0210", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2001/a01o0210/a01o0210.pdf>; Transportation Safety Board of Canada, "Aviation Occurence Report, Controlled Flight Into Terrain, Cessna 402, N67850, Wabush,Newfoundland, 23 NM NW, 22 october 1995, Report Number 195Q0210", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/1995/a95q0210/a95q0210.pdf>; Transportation Safety Board of Canada, "Aviation Occurence Report, Collision With Terrain, Cessna 188 AGWAGON C=GYUD, Marengo, Saskatchewan 2 mi S 29 June 1994, Report Number A94C0119", (24 April 2013), online: *Transp Saf Board Can* <http://www.tsb.gc.ca/eng/rapports-reports/aviation/1994/a94c0119/a94c0119.pdf>.

Pilots are no different from any other human beings; they also suffer from the adverse effects of fatigue as a result of their work schedules. Unlike working in an office setting, the safety implications of making a mistake in a cockpit can have deadly consequences. Given the nature of the civil aviation industry, professional pilots in Canada face atypical work schedules, often working in remote areas, away from their usual place of residence, and they must cope with demanding operational constraints. With air carriers operating across the world twenty-four hours a day, 365 days a year, pilots must fly day and night, sometimes travelling across several time zones in a single shift, while being responsible for the lives of hundreds of passengers. Competitiveness within the industry also compels many pilots to work long hours to satisfy a demanding clientele. While working under these operational constraints, pilots are significantly more vulnerable to the effects of fatigue.

Although the flying profession is often believed to be glamourous and exciting, which is certainly the case from time to time; aviation is not a "nine-to-five" profession and has many drawbacks unfamiliar to most Canadians. Aviation can be a ruthless and cutthroat industry, which is fuelled by passion, competitiveness and money. Pilots often fall victim to this reality and are exposed to gruelling work schedules to satisfy a demanding market. Although aviation has been referred to as the most regulated method of transportation in the word, pilot fatigue still remains a threat to flight safety in the 21st Century.

Upon writing the above-referenced journal, the author concluded that the effectiveness of flight and duty time regulations was an understudied area of the law. Therefore, this study focused on the factors that positively and negatively affect a pilot's flight performance, including the impact of their work schedule on flight safety in Canada.

This study was launched to analyze the effectiveness of flight and duty time regulations, specifically for Canadian operators conducting commercial operations under Part VII of the *Canadian Aviation Regulations* (CARs) as 702, 703, 704 and 705 operators.[5] This research aimed to determine whether federal laws adequately regulate pilot fatigue and if there are some gaps

[5] The commercial aviation industry in Canada is regulated under Part VII of the CARs, with five operator categories assigned based on the type of aircraft flown, the number of passengers carried and the nature of the operations conducted: aerial work operators (CARs subpart 702), air taxi operators (CARs subpart 703), commuter operators (CARs subpart 704) and airlines (CARs subpart 705). More information about these operations is provided in the above-referenced journal article.

within the CARs. Because the CARs regulate FDT differently depending on the category of operator (see **Appendices 1 and 2**), this study also tried to determine whether there are positive or adverse safety trends with respect to fatigue currently affecting particular categories of carriers.

Methodology

The above-reference article highlighted several issues with respect to the health and safety of professional pilots in Canada due to outdated FDT regulations in the CARs. Consequently, it was decided that a field study with key informant interviews would supplement the findings of this article with tangible evidence provided by participants whose institutional or professional occupation and experience was relevant to a study on the effectiveness of FDT regulations.

A proposal for the key informant interviews was approved in 2016 by the Office of Research Ethics and Integrity at the University of Ottawa. One of the key aspects of this study was that participants would remain completely anonymous given the sensitive nature of this topic. Participants took part in audio-recorded interviews lasting between 45 and 90 minutes. These interviews were later transcribed, anonymized and summarized in the analysis provided in this report.

Key informant profiles

Five participants were interviewed in 2016 and 2017. These individuals were recruited based on their experience in the Canadian civil aviation industry in Canada.[6] The profile of each participant is summarized in **Appendix 3**. Participants were anonymized in order to maintain confidentiality over their personal views regarding pilot fatigue and FDT regulations.

Results of the study

Based on the interviews conducted with the five key informants, a summary of the facts & findings was produced based on the issues highlighted during these discussions. The study focused on five aspects of FDT regulations to understand their positive or adverse impact on pilot fatigue: (1) work schedules; (2) pilot remuneration; (3) fatigue and stress; (4) company safety culture and

[6] In civil aviation, the experience of a pilot is valued based on a person's flight experience and number of flying hours.

work environment; and (5) industry issues. These five aspects are addressed and briefly analyzed in this section of the report.

1. Work schedules

The atypical nature of pilot work schedules was a common issue noted by all informants, regardless of the type of operator. In all cases, pilots noted that their work schedule is not a typical "nine to five" work schedule, as they are scheduled to fly at all hours of the day, and in some instances, fly across several time zones. As discussed in this section, the study determined that certain work schedules are more likely to affect a pilot's ability to maintain a structured lifestyle and regular sleep schedule.

1.1 Type of flight operation

The study revealed that the work schedule for pilots could vary depending on the type of flight operations conducted. In smaller operations, namely 703 operators (air taxis), the study revealed that pilots are more likely to be exposed to atypical work schedules in unorthodox working environments, such as flying to and from remote locations in northern parts of Canada. These pilots are also required to fly longer hours, often to maximise the operator's revenue. Indeed, smaller operators often rely on a smaller roster of employed pilots. Hence, any flight cancellation or a pilot's refusal to fly (e.g. due to pilot fatigue) can amount to a loss of revenue for both the operator and the pilot. Several informants noted that this added a pressure to fly regardless of the potential for pilot fatigue.

Three of the five informants admitted working from time to time beyond the maximum duty time (*generally* 14 hours per day) established by the CARs, often because of operational pressures and unplanned circumstances (e.g. weather or mechanical issues). In most cases, informants noted that smaller operators often demand more from their pilots as far as the number of tasks required and the number of hours of work.

For instance, Informant #1 often flew between 8 and 14 hours a day.[7] Once he started flying for a 705 operator (Airline), he was never required to be on duty for more than 85 hours a month. In his view, this significant variation highlights the different realities that pilots must face with smaller operators in comparison with larger airlines. He viewed this as a paradox, because less-experienced pilots often start flying for 703 operators upon graduating from flight school and are exposed to more demanding work schedules, while more experienced pilots are hired by large airlines that require them to be on duty, on average, for approximately 20 hours a week.

When he worked for an air taxi operation, Informant #2 conducted seasonal contracts for a hunting & fishing outfitter in a remote location in northern Canada. Because of the shorter operational window to conduct this type of "bush flying", Informant #2 was required to work on 10-day work rotations with only one day off in between each rotation. He was expected to fly up to 12 hours a day and be on duty for an average of 15 hours a day, even though the maximum duty time allowed under the CARs is 14 hours per day. Informant #2 estimated that he would be working on average between 60 and 65 hours on duty every week, and up to 100 hours (on duty) per week during peak periods. While airlines required their pilots to work 85 hours a month (on duty), Informant #2 was working over three times that amount with an average of 250 hours on duty each month.

Informant #2 admitted that his employer imposed a very demanding work schedule, with a turnaround time of about 6 minutes between each flight, leaving him with little time to rest and eat during the day, which affected his energy levels. Because he lived on the airbase in the owner's hunting/fishing lodge, Informant #2 was also required to do odd tasks, such as setting up hunting camps, clearing small wooded areas, general maintenance around the various lodges owned by the outfitter, washing the airplanes etc. He noted that these additional tasks would have an impact on his fatigue levels.

When he worked for a 703-704 operator, Informant #3 stated that he would fly on average between 45 and 55 hours a week and be on duty between 60-70 hours a week. He benefited from a more relaxed work schedule once he started working for a 705 operation, where his duty time was capped at 85 hours per month. This reasonable work schedule was common among informants

[7] While Informant #1 was assigned to longer working shifts when he worked for a 703 operator, he had an irregular work schedule, and was often on-call for charter and medical evacuation flights. Therefore, there were weeks when he did not fly at all, and others where he would work several days in a row.

with experience working for larger operations, such as 704 and 705 operations. These informants are usually on schedule for an average of 75 hours a month, and up to a maximum of 85 hours a month with the possibility, but not the requirement, to do some overtime.

One exception was Informant #4 who flew on average 6.5 hours a day and was on duty for about 8 hours each day. His employer expected him to fly between 40 and 50 flight hours each month, therefore providing him with a relatively convenient work schedule. This particular informant noted that his longest day working for this employer was around 8 hours of flight time and 10 hours of duty time. He associated this work schedule with the safe working culture imposed by his employer. As for Informant #5, he held another full-time job outside the aviation industry in addition to working as a flight instructor. Depending on the week, he could be flying a dozen flight hours as a flight instructor in addition to his full-time office job (37.5 hours), resulting in about 50 hours of duty time (if we include both jobs).

1.2 Standby duty

For pilots on standby duty, commonly referred to as being "on-call", pilots noted that this type of assignment was particularly tiring, namely because pilots had to be ready to come into work and fly at any time of the day. Some pilots would start their standby duty later in the day (e.g. late afternoon or early evening), even though they had been awake since the morning depending on various circumstances (e.g. family, non-work related commitments, natural sleep cycle etc.). In some instances, on-call pilots would end up being awake for over twenty-four hours by the time they were completing their final flight of the day (when they were called into work). The study therefore determined that standby duty can have serious effects on the fatigue of pilots if regulations do not take into account the time since awakening of pilots.[8]

1.3 Night flights

Pilots in our study reported that they are more likely to be fatigued at night. Firstly, flying at night conflicts with the human body's natural sleep cycle, and secondly, night flying can be

[8] The *Canadian Aviation Regulations* currently do not take into account a pilot's time since awakening. Proposed amendments to the CARs with respect to FDT will not regulate time since awakening either.

more challenging at times for various reasons (e.g. the lack of visual references which makes navigation more important but also more difficult).

One interesting discussion on the topic of night flying was with Informant #1. Before working for a large airline, Informant #1 was previously employed by an air taxi operation conducting medical evacuation flights (commonly known as "Medevacs") carrying patients, mostly in remote and northern communities. He was called in at all hours and had the added pressure of knowing that if he refused a medevac flight (e.g. because of fatigue), his decision could prevent a patient from receiving the necessary medical treatment, as medevac flights are often the last resort for patients in critical condition. He found night flights to be more fatiguing because they would go against his circadian cycle. He would sometimes be landing on his final flight of the day with the sun rising. He mentioned being awake for over 24 hours more than once because he was called in for a night medevac flight. While he found medevac flights to be exciting, these assignments were particularly fatiguing at times.

In all cases, pilots admitted being more fatigued when conducting flight during night hours because they felt it was not natural for them to be awake at that time and therefore difficult to perform at 100% of their capabilities throughout the flight. Informant #3 recounted several instances when he was scheduled to fly at night, then check in a hotel for about five hours to sleep and subsequently wake up early the following morning to conduct the company's first morning flight. He found it difficult to get proper sleep within that short window of time and stated that he would "live in a constant nap life" where he could not always get the full sleep he needed to recover from fatigue. It was noted by some informants during the study that additional rest periods should be provided to pilots conducting night operations and that FDT should add distinctive regulations for night operations (e.g. take into account the time since awakening).

1.4 Deadheading

An interesting feature with the CARs is how duty time is only triggered once a pilot *reports* to his or her place of employment or reports for standby duties as a reserve pilot, and finishes when the aircraft engines are shutdown.[9] On the other hand, ICAO states that time spent deadheading

[9] *Canadian Aviation Regulations*, subsection 101.01(1).

should be counted towards duty time.[10] However, this is a non-binding recommended practice. ICAO does state that the time spent by a pilot travelling from his or her home to the point of reporting for duty (i.e. commuting) does not count towards duty time,[11] even though ICAO recognizes that this can have an adverse effect on pilot fatigue.[12] The CARs also infer that duty time does not include the time spent travelling as a flying passenger to and from another base of operations (i.e. an airport) to conduct flight operations,[13] otherwise referred to in the industry as "repositioning"[14] or "deadheading". At the time of this writing, the CARs did not expressly identify whether or not deadheading time should be calculated in the total duty time and it remains unclear how air carriers consider deadheading time.

This highlights a regulatory void where pilots may be required to commute considerable hours, without that time being included in their duty time or even remunerated. By interpreting current duty time regulations, it seems apparent that a pilot who flies in the jump seat of another flight to report to another sub-base of operations[15] where he or she is scheduled to fly, will only start calculating his duty time once he or she *reports* at the latter base of operations. Of course, many companies will manage this potentially unsafe interpretation of the CARs with adequate policies to manage pilot fatigue and thus fill this regulatory gap. However, smaller cash-strapped

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[10] *Annex 6 to the Convention on International Civil Aviation (Tenth Edition - Standards and Recommended Practices - Part 1 International Commercial Air Transport - Aeroplanes*, International Civil Aviation Organization, 15 June 2011, AN6 [*Annex 6*], ch 1. at ATT A-2 and ATT A-8 provides:

> All time spent positioning counts as duty, and positioning followed by operating without an intervening rest period also counts as flight duty.

In the wording of the SARPs, the term "should" indicates a non-binding recommended practice and is therefore not compulsory for ICAO member States.

[11] *Annex 6*, at ATT A-2:

> 2.3.2 A flight duty period does not include the period of travelling time from home to the point of reporting for duty. It is the responsibility of the flight or cabin crew member to report for duty in an adequately rested condition.

[12] *Ibid.* Annex 6 – s 4.8.1 states that:

> Travelling time spent by a flight or cabin crew member in transit between the place of rest and the place of reporting for duty is not counted as duty, even though it is a factor contributing to fatigue. Excessive travelling time undertaken immediately before commencing a flight duty period could therefore detract from a flight or cabin crew member's ability to counter fatigue arising whilst on duty, and should therefore be taken into account when deciding where pre-flight rest should be taken.

[13] Indeed, no laws or interpretative guidance regarding FDT regulations specify whether or not time spent deadheading must be calculated when monitoring FDT compliance.

[14] *Annex 6*, at ATT A-4. ICAO defines "positioning" and "deadheading", which are synonymous terms, as the "transferring of a non-operating crew member from place to place as a passenger at the behest of the operator".

[15] *Canadian Aviation Regulations*, section 700.01:

> sub-base means a location at which an air operator positions aircraft and personnel and from which operational control is exercised in accordance with the air operator's operational control system.

operators may be tempted to utilise their pilots up to the very limits permitted under the law, even if doing so may not be entirely safe. In this regard, ICAO standard states that pilots are responsible for refusing further flights if they suffer from fatigue, which may adversely affect flight safety.[16]

Based on the data collected during the key informant interviews, the study determined that deadheading is also a common practice for pilots, who are required from time to time to travel regularly between several bases of operation, either by car or by airplane. Some pilots count this time into their duty time, while some do not. Accordingly, some pilots would be paid for this time and some would not. The study determined that employers with a good safety culture were more likely to count deadheading into a pilot's total duty time. The discussions revealed that there was no common practice for computing deadheading in the aviation industry, as the CARs do not specifically address the concept of deadheading, nor specify whether it should count into a pilot's duty time. The study was not able to conclusively determine the effects of deadheading on pilot performance. When travelling away from his place of residence, one pilot did note that sleeping in a hotel[17] certainly affected his ability to recover from fatigue over a long period of time, and another pilot mentioned that he actually enjoyed deadheading because it allowed him to decompress.

1.5 Flight instructors

For informants who worked as flight instructors,[18] the study found that these pilots can often be on duty for up to 12 hours a day, and up to 60 hours a week. These informants all noted that flight instructing is even more demanding than transporting passengers; flight instructors must supervise and instruct unlicensed student pilots with little to no flight experience, whilst engaging in all sorts of challenging flight manoeuvres. This increases the risk factor when fatigue comes into play.

These informants noted that flight instruction was particularly fatiguing because flight instructors are usually at the dawn of their careers and relatively inexperienced, which brings a considerable pressure: maximizing their flight time to generate both experience and income. As a result, these

[16] *Annex 6*, at ATT A-2.
[17] If a pilot checks in a hotel, this would be considered as a rest period under the CARs. Therefore, the time spent in a hotel cannot be counted towards a pilot's total duty time.
[18] It must be noted that flight instructors are not subject to any FDT regulations in the CARs.

pilots are often on duty for very long hours to meet this objective, which can compromise flight safety. One informant remembered a time during his flight training where his own instructor fell asleep during a night flight. When he became an instructor himself, he understood how a pilot could become fatigued to the point of falling asleep; he noted that it was not uncommon for him to arrive at work at sunrise and leave after sunset, in many instances on duty for up to 15 hours. In sum, these circumstances create a higher risk for pilot fatigue in the flight-instructing world and can compromise a flight instructor's ability to safely perform at times.

1.6 Secondary employment

Four informants were required to hold secondary employment to make ends meet at the beginning of their careers. Three of these informants had a full-time job whilst holding a permanent flying job, with another informant holding a part-time job at the airport to generate an additional revenue. This time was not counted towards their duty time as defined by the regulations and therefore exposed these pilots to a higher risk for pilot fatigue.

For Informant #1, this additional duty time outside his flying job varied between 30 and 60 hours a week depending on the time of year and individual circumstances (e.g. family, financial commitments etc.). The study found that holding a secondary employment might increase the risk of pilots becoming fatigued when combined with a full time flying schedule.

2. Pilot Remuneration

During the study, the informants were invited to discuss their method of remuneration as pilots, which proved in some cases to be a risk factor with respect to fatigue. The interviews revealed that some informants were paid strictly for their flight time, which creates a pressure to fly as many hours as possible in order to maximize their income. This pressure is particularly important in the aviation industry given that many pilots graduate from flight school with a considerable amount of debt. Secondly, the number of flying hours is important for a pilot as the more hours he or she accumulates, the more chance he or she has to be hired by a large airline (hence the need to generate more flight time). Therefore, because salaries are relatively low in the early stages of a pilot's career, some informants felt pressured to fly more hours to maximise their income.

Other informants were paid a base salary, and in some cases, the base salary included an hourly rate for each hour flown. Informant #2 revealed that being paid a base salary was not necessarily a positive factor. He discussed his experience flying for an air taxi operator who paid him a base salary, but expected him to fly very demanding schedules in order to maximize his company revenue and optimize the employer's "investment". This informant found the method used to determine his salary to be a stressful factor, as he was imposed a very demanding schedule where he had to fly as many hours as he could, regardless of whether he felt fatigued or was complying with FDT regulations. This method forced him to optimize his employer's time and money. In this company, money often prevailed over regulatory compliance (e.g. FDT regulations) and thus flight safety.

Informant #2 stated that a base salary method may be better than paying pilots for each hour flown, as long as the employer is responsible and safety-oriented, which was not the situation in his case. In his opinion, salary structures based on each hour or mile flown are an incentive for pilots to maximize (in each workday) their flight time and revenue, in some cases even though flight safety is at risk of being compromised. Informant #2 compared pilots with politicians: if both are not paid enough, "corruption" will take over and pilots will be tempted to breach the CARs in order to satisfy their self-interest, over the safety of others. In his view, a low-pay structure cannot foster safe behaviour in the long term.

Another interesting finding was the remuneration for secondary ground tasks when pilots are not flying. In some cases, these tasks outside the cockpit amounted to several hours a week and could be very demanding and tiring depending on the employer. While flight-planning tasks (e.g. navigation, weather, fuel calculations etc.) were common for every informant, some were required to fuel the aircraft, load heavy cargo, de-ice or wash the surfaces of the aircraft, manage passenger bookings and boarding, maintain their flight base, ensure snow removal at the airport etc.

Some informants were paid for these secondary tasks, but others were not. In the latter case, there placed pressure on them to expedite their turnaround times on the ground in order to log more flight time – the "billable hours", and thus generate more income. This limited their ability to rest between flights. Some informants noted that this pressure to operate the most efficiently possible prevented them from attending to some of their most basic needs, such as resting, going to the washroom and eating properly.

In sum, based on the data collected by this study during the interviews with the five key informants, the study could not determine if a particular method of remuneration is more likely to mitigate or increase pilot fatigue.

3. Fatigue & Stress

Several informants shared their experiences dealing with fatigue and stress. These aspects were often aggravated or mitigated by the nature of their work schedules; the time of day; and the workload imposed by their employers before and after each flight.

For instance, Informant #1 admitted that he briefly fell asleep more than once while flying early in the morning, or in the evening, when he was employed by an aerial work operator (CARs subpart 702). When he worked for an air taxi operation (CARs subpart 703) conducting medical evacuation flights in northern parts of Canada, Informant #1 often felt fatigued because approximately 75% of his flights would take place at night and prevent him from maintaining a regular sleep schedule. As a result, Informant #1 would sometimes find himself flying without any sleep for periods of 24 hours or more. In those instances, he admitted that he would struggle to remain focused and awake. He noted that evening flights were more tiring because of the reduced lighting and interaction in the cockpit, and that long breaks in between flights (e.g. waiting for medevac patients) could substantially increase his fatigue levels. When fatigued, he would drink caffeine or "pinch" himself to remain awake.

Informant #2 shared similar experiences and noted that he would often make more mistakes when he was tired. He noted that he would sleep on average 4-5 hours each night because of his work schedule, although it would not be unusual for him to be awake for up to 24 hours on busy days. Because of his passion for flying, but also because it was frowned upon to refuse a flight, Informant #2 never refused a flight when he felt fatigued, which he admits was not the safest approach to adopt. Informant #2 never fell asleep when at the control of an aircraft but he does remember several instances when he was "groggy" and felt like he may fall asleep at the controls of his aircraft.

Informant #3 also confirmed that it is not a myth that pilots who fall asleep in the cockpit. He was aware of stories where one pilot would sleep while the other would fly the aircraft (in airplanes required to have two pilots onboard). He has also witnessed a fellow pilot struggling to stay awake

in the cockpit. Informant #5 noted that when he felt fatigued, he was more likely to miss some items in his cockpit checklist and would find that his flying skills were not at the level they should be. Informant #5 learned to mitigate fatigue by self-imposing personal limits, working with management to arrange his schedule (as much as possible) and trying to refuse flights when he did not feel 100% safe. On the other hand, Informant #4 noted that he did not experience fatigue at the controls of an aircraft, simply because he would not accept a flight if he felt fatigued.

Informants who experienced fatigue all agreed that their work schedule played a big role in their fatigue levels, as there was an added pressure to conduct flights in order to satisfy their employers' commitments, generate some income and increase their flight experience. This study found that demanding work schedules increase the risk for pilot fatigue, whereas reasonable work schedules, often found in larger flight operations (704-705 operators), allow pilots to rest adequately. Most informants found that pilot fatigue is a *taboo* subject in the aviation industry, and is rarely discussed among pilots and employers. As a result, some employers may take advantage of their pilots, knowing fully well that pilots are likely to remain silent and accept most, if not all flights because of the competitive nature of the industry. In all cases, the informants agreed that pilot fatigue affects the accuracy of their flying and can compromise their safety.

4. Company safety culture & work environment

The study found that the determining factor in the field of pilot fatigue was the employer's safety culture and inclination to comply, or in some cases, ignore/circumvent FDT regulations. This factor was the strongest influence on the effectiveness of FDT regulations within each operation and the employer's ability to mitigate pilot fatigue. With only a sample of five informants, the study was not able to conclusively determine whether a particular type of operation (air taxi, commuter, airline etc.) was more inclined to comply or not with FDT regulations. Moreover, the study was not able to determine whether compliance with FDT is currently an issue in civil aviation. The study actually found that in all likeliness, *most* Canadian companies comply with FDT regulations. However, this study noted that some operators who demonstrate a weak safety culture by ignoring FDT regulations do exist.

The study revealed that when operators struggle to generate a profitable revenue stream, or operate in informal or less-structured work environments (e.g. in remote locations), it is more likely that

unhealthy decisions are made; pilots are then left with little operational support and therefore more vulnerable to pilot fatigue. Pilots operating in northern parts of Canada, where government oversight is not as prevalent and where companies have a different culture, were sometimes pressured to ignore FDT regulations and conduct flights even when they felt fatigued. This can be partly explained due to the realities of the North, where air operators constitute the sole lifeline for many isolated communities with no road access to the rest of Canada. Hence, refusing a flight can result in a community not receiving food deliveries, medical attention or other much-needed supplies.

The study did reveal that commuter (CARs subpart 704) and airline (CARs subpart 705) operators were not exposed to the same level of risk as aerial work operators, air taxi operators or flight training units. This is because commuter and airline operations operate aircraft, which mostly require two pilots, whereas other operations often operate with only one pilot onboard. Flying along with another pilot provides an extra safety defence when mistakes are committed; increases the cockpit interaction which keeps pilots alert; and provides a supporting figure in the cockpit when the other pilot is fatigued for whatever reason.

4.1 Company approach to FDT limits and regulatory compliance

Informant #1 and #2 had similar experiences when they worked for an air taxi operator (CARs subpart 703). They both experienced instances where incorrect information was intentionally entered into FDT time records in order to circumvent regulations. These informants felt like they had to turn a blind eye to such violations, since they were at the dawn of their careers and feared that they may be "blacklisted" or viewed as a whistleblower in the industry if they ever complained. For example, the pilot's actual FDT would sometimes be more than the recorded FDT in the company's records. These informants believed that this practice might be more common than one may think since there is little oversight focusing on FDT records. These informants stated that this practice emerged because of the employer's pressure to optimize time and money, which often conflicts with the FDT limits found in the regulations. Indeed, labour costs account for 30% to 40% of an airline's expenses.[19] If FDT limits are reduced even further with new regulations, air

[19] Paul Stephen Dempsey & Laurence E Gesell, *Airline Management Strategies for the 21st Century*, 3rd ed (Chandler, AZ: Coast Aire Publication, 2012) at 606.

carriers will not be able to utilize their pilots as much and will need to hire additional pilots to meet the demand. Therefore, industry experts have predicted that more strict FDT regulations could potentially result in the increase of operational costs by up to 30%.[20] Therefore, some industry stakeholders may expect a reduction in profit, unless airlines increase their prices or reduce their pilots' salaries.

Informant #2 worked for a particularly demanding air taxi operator who pressured him to fly as many hours as possible. He noted that if he ever brought to his employer his concerns about pilot fatigue or breaching FDT limits, he would risk being fired. He did not feel like he could challenge his employer's practices, which sometimes ignored FDT regulations. He discussed one situation where his aircraft suffered a catastrophic engine failure and in-flight fire. He conducted an emergency landing alone in a remote location and did not sustain any injuries. He did however suffer from stress, anxiety and fatigue as a result of this traumatic experience. Because he did not feel safe to fly the next day, he asked his employer for a day off. He remembers having bags under his eyes and feeling very distraught at the time of his request. The employer said that if he took the next day off, he was going to be fired. This event taught him that regardless of his fatigue levels, even following an exceptional event, he was not in a position to refuse any flight assignment if he wanted to keep his job.

He found this situation to be very difficult, as he had to choose between safety and his dream job as a bush pilot. As many pilots would do, he chose the second option; he flew the very next day after his emergency landing; and continued working for that employer for the rest of the flying season. Informant #2 stated that an employer's complacency and resistance towards FDT regulations will often spread throughout the entire company, including the company's pilots. He concluded by stating that in northern Canada, "it is the Wild West: anything goes". Informant #2 believes there may be a problem with pilot fatigue in aviation given the potential for operator abuse. Informant #2 stated that complying with regulations, such as FDT limits, is not viewed by some operators as a profitable approach, thus regulations are not always followed.

[20] Indeed, if employers are required to reduce their pilots' FDT under more strict regulations, employers will likely need to hire more pilots, thus increasing their operational costs. "Sleepy pilots target of new Transport Canada rules", *Metro News* (18 September 2014), online: Metro News <www.metronews.ca/news/canada/2014/09/18/sleepy-pilots-target-of-new-transport-canada-rules.html>.

Informant #5 also felt an underlying pressure from his employer to fly as much as he could which he felt was draining at times. Informants #1, #2 and #5 all agreed that management has a direct impact on the fatigue levels of their pilots depending on the schedules they decide to impose. In their opinion, the first defence for pilot fatigue is management followed by the pilots themselves. If the pilots are offered reasonable work schedules, they are more likely to be well rested, make safe decisions and perform in the cockpit. If they are pressured to fly too many hours, this will increase the likelihood of pilot fatigue, bad decision-making and put their safety at risk.

4.2 Company strategies and safety defences to prevent pilot fatigue

The study looked into the various mechanisms (otherwise known as "safety defences" in civil aviation) in place to mitigate pilot fatigue in civil aviation. Informants #1 (when he worked for an airline – CARs subpart 705), #3 and #4 had to work with an FDT tracker system where the company would accurately record and monitor their pilots' FDT. When they would approach their maximum FDT, the system would send an alert to both the pilot and management. The system would also prevent pilots from being scheduled by the system on a flight, which would exceed their maximum FDT.

Moreover, two of these informants (#1 and #3) were unionized and stated that their collective bargaining agreement did provide additional protections against unreasonable work schedules. FDT limits were reiterated in their collective bargaining agreements, which also provided additional rest time for pilots. Indeed, their collective bargaining agreement had maximum FDT, which were stricter than the FDT limits in the CARs. Although these two informants are part of a very small sample in this study, the study noted that unionized pilots were more likely to have more stringent FDT rules within their collective bargaining agreement, in comparison with existing FDT regulations in the CARs.

Informant #3 also mentioned that if he exceeded his maximum FDT, he would have to file a safety report where the safety officer of the company would have to investigate the reasons for this breach and how it could be prevented in the future. As a result, these informants' employers closely monitored the FDT limits.

In order to prevent fatigue, the employer of Informant #4 also had a policy where recent hires could not fly more than 5 hours each day. This informant also felt comfortable to discuss fatigue with his employer and felt encouraged to take time off if needed or even refuse a flight when he felt that he might be fatigued. One interesting aspect of the employer for Informants #1 (when he worked for an airline), #3 and #4 was that pilots could remove themselves from a flight roster due to fatigue. If the pilot mentioned that his absence from work was due to fatigue, he would not lose a sick day or lose any salary.

In sum, the study revealed that while some employers may have an approach where profitability prevails over regulatory compliance and their pilots' fatigue, others have a safer working culture where a non-punitive approach is endorsed with a view of protecting the health and safety of their pilots.

5. Industry issues

The study revealed that certain sectors in the civil aviation industry might be more at risk of fostering pilot fatigue. The study found that smaller companies often operate with a thin profit margin, which increases their risk of favouring profitability over regulatory compliance. While this is not the case for every operator, the study revealed that given their nature and financial health, pilots working for these operators are nonetheless prime targets for pilot fatigue. In addition, these operators often employ less-experienced pilots, thus more susceptible to the effects of pilot fatigue. Finally, operators working in remote locations are not afforded the same levels of infrastructure and are not subject to the same level of oversight from Transport Canada. When an operator shares all these factors, it is a perfect recipe for pilot fatigue to develop as a threat to safety.

5.1 Smaller operators versus larger operations

Informants with experience working for air taxi operations noted that it is more challenging to work for a smaller type of operation, especially since many of these companies operate in remote & northern locations. This exposes pilots to more challenging weather conditions, provides them with less infrastructure and exposes them to an unorthodox work environment.

In their view, not all smaller operators consider pilot fatigue when scheduling flights; it is the money that is the driving force in the industry, which has a very slim profit margin. Because of the

fierce competition among operators, management often finds creative ways to cut down on operational costs by reducing pilot salaries and optimizing their use of pilots. This method of conducting business is conducive to more pilot fatigue. Several informants noted that a lot of this pressure comes from clients who are often very demanding. Informant #1 mentioned that operators are sometimes faced with the difficult choice of declining a flight and losing business, or accepting a flight and breaking the law. In his view, compliance and safety have a price in the eyes of employers wishing to maximize their revenue. Informant #2 had a similar vision and stated that while a company must mitigate safety risks, it must do so in light of its ability to remain in business.

However, most informants agreed that this type of pressure is not as prevalent in the commuter and airline industry sectors where companies are usually healthier financially and where pilots are protected by collective bargaining agreements that impose strict scheduling limits. It was noted by some informants that given the size of these larger operators, commuter and airline operations usually have the infrastructure and the resources available to closely monitor and enforce FDT limits without these requirements affecting their ability to operate or generate a decent income. On the other hand, smaller operators often rely on a very small roster of employees and therefore do not have the luxury to monitor FDT or remove a pilot from their flight schedule simply because a pilot is fatigued.[21]

Informants #3 and #4 argued that most companies do follow FDT regulations and make an effort to mitigate pilot fatigue by adopting reasonable work schedules. Informants #3 and #4 never witnessed a pilot or an employer breaching FDT limits. The distinguishing factor between them and the other informants (#1 (when he was employed by a 703 operator), #2 and #5) was the safety culture endorsed by their employers; the former group worked for employers more inclined towards the profitability of their businesses, and the latter group's employers had a better safety culture.

[21] While some informants were paid for each hour flown, including overtime pay, some were not paid for any overtime, which increased their exposure to longer work schedules. Even if pilots are paid overtime rates, air operators generate the bulk of their profit when their aircraft are flown. Therefore, the revenue generated from these flights usually outweighs the cost of paying overtime when pilots go beyond a standard work schedule.

5.2 Transport Canada Oversight

Another issue raised by the informants was the lack of government oversight, in particular surveillance activities, to verify whether all operators comply with FDT limits. Nowadays, Transport Canada inspections are pre-announced and are usually scheduled on average every two years. This allows delinquent companies to circumvent FDT regulations with little Transport Canada surveillance to proactively identify and address potential safety deficiencies in connection with pilot fatigue.

For instance, Informant #1 mentioned that his employer would create false records, including FDT documentation, prior to a Transport Canada inspection, either because these were never created, even though required by regulation, or to give the impression that the operation was compliant with FDT regulations. Because these inspections are generally pre-announced, some operators in the industry simply do not follow the regulations and wait until their inspection cycle is due to create supporting, yet fraudulent FDT records. As a result, it is very easy for some operators to produce incorrect or false documents to cover up their contraventions to the CARs, giving the regulator the impression that these operators comply with FDT regulations, when in fact they may be running an unsafe operation. In other cases where operators unintentionally breach FDT regulations, it is very difficult to address this problem because of the few TC resources allocated to this particular issue (FDT regulations).

Informants #1 and #2 noted that this practice is more prevalent in northern "bush flying" operations, where it is even more difficult for Transport Canada to conduct regular inspections given the geographical remoteness of some companies. Informant #2 noted that, in his time working for an air taxi operator, there was a "leave no trace" mentality when it came to FDT records; a lot of documentation was never produced or intentionally obscured to avoid documenting his employer's violations of the CARs. Once again, the study found that the employer's culture and approach to safety had a strong influence on its overall regulatory compliance.

Concluding Remarks

The purpose of this study was to analyze the effectiveness of FDT regulations in Canada. Due to the small sample of key informants interviewed during this study, it is not possible to generalize the findings of this study to the entire aviation industry in Canada. However, this study provides a glimpse of the daily realities of pilots and how they must cope with a competitive and demanding industry.

One finding did stand out: an employer's safety culture concerning FDT regulations has a strong influence on the wellbeing of pilots, including their fatigue levels. Employers with a generally safe approach to all facets of their operations appear to favour safety over profitability. On the other hand, short-line and cash-strapped operators struggling to balance safety with profitability appear to be more inclined to breach FDT regulations in order to maintain a competitive position in the market. It appears that these companies are also more inclined to employ older aircraft and less-experienced pilots in order to cut costs. This study also found that operators who cut into core safety aspects of their operations, such as increasing their pilots' FDT times, are at risk of having fatigued pilots at the controls of their aircraft.

It is undeniable that the work schedule is one of the main factors affecting the fatigue of employees in any industry. Fatigue can be positively affected by a company's organizational culture and safety policy, which should take into account scheduling and pilot fatigue.

It remains unsure whether the new FDT regulations scheduled to come into force in 2018 will be more effective and/or bring a complete cure to pilot fatigue.[22] New rules do not in themselves guarantee their effectiveness, but they can contribute to prevention and foster a good safety culture across the civil aviation industry.[23] The findings of this study suggest that FDT regulations are

[22] The Canada Gazette - Vol. 151, No. 26, "Regulations Amending the Canadian Aviation Regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods)", (1 July 2017), online: Department of Transport <http://www.gazette.gc.ca/rp-pr/p1/2017/2017-07-01/html/reg2-eng.php> ("The proposed regulatory amendment would introduce a range of flight duty period from 9 to 13 hours" depending on the time when a flight is scheduled to take off. Moreover, the number of hours a pilot would be entitled to fly each year would be reduced from 1,200 to 1,000 hours annually. Another notable change would be the introduction of a period of time free from duty of 33 consecutive hours every 8 days, where the time free from duty would commence no later than 22:30 and end no earlier than 7:30. This mandated period of time free from duty would provide pilots with two sleep opportunities and therefore allow them to recover from the effects of cumulative fatigue).

[23] René David-Cooper, "Landing Safety Management Systems (SMS) in Aviation: The Implementation of Annex 19 for Commercial Air Carriers in Canada" (2015) 30:1 Ann Air Space Law at 46. In the context of civil aviation, good safety culture exists when there is a strong managerial leadership, which supports the wellbeing of its workforce and

effective only when the operator commits to a good safety culture and is supported by adequate oversight by Transport Canada. When both these elements are in place, existing and future FTD regulations will have a stronger influence on the fatigue levels of Canadian pilots. While fatigue is not unique to pilots, the stakes are higher when flying an aircraft. While there is much emphasis on the regulator adopting new rules, individual operators are in the strongest position to address pilot fatigue with their organizational approach to this issue.

In sum, this study found that FDT regulations are generally effective when operators are compliant with the CARs. This study found that pilots are perhaps less fatigued than media stereotypes would suggest, but that a fatigue problem does exist with some operators, particularly with less-experienced pilots at the dawn of their careers. As discussed by the author in his journal article, the current FDT regulations are certainly not perfect, but they do mitigate pilot fatigue when the rules are followed.

As discussed in the journal article,[24] there are also economic issues in the industry that must be considered; financially healthy operators will make healthy decisions, and *vice versa*. The author therefore believes that the effectiveness of FDT is a systemic issue in the industry that will require particular attention once the new regulations come into force in order to ensure that all operators commit to these upcoming changes.

To implement a healthy safety culture, it is up to the regulator to ensure its presence in the industry with active oversight not solely focused on enforcement, but also on cooperative strategies aiming to foster organizational changes with operators struggling to balance profitability and compliance. While Transport Canada cannot "regulate" a company's safety culture, it certainly has a role in fostering one. The effectiveness of FDT regulations does not lie on their legal framework, but rather on the individual safety culture of each operator.

prioritizes regulatory compliance over profitability. Strong communication about safety between senior management and employees, using safety newsletters, notices and bulletins, for example, enhances the overall promotion of safety within the organization.

[24] René David-Cooper, "Protecting the Health and Safety of Pilots: A Critical Analysis of Flight and Duty Time Regulations in Canada" (2016) XLI Annals of Air and Space Law 81.

Appendix 1 – Maximum flight time (Canadian Aviation Regulations, s.700.15, Part VII, *Division III — Flight Time and Flight Duty Time Limitations and Rest Periods*)

	Within 365 consecutive days	Within 90 consecutive days	Within 30 consecutive days	Within 7 consecutive days	Within 24 consecutive hours
Aerial work **702 Operators**	1,200 hours	300 hours	120 hours or 100 hours for flight crew members on call	60 hours	8 hours for single-pilot IFR operations No flight time limits for VFR operations
Air Taxis **703 Operators**	1,200 hours	300 hours	120 hours or 100 hours for flight crew members on call	60 hours	8 hours for single-pilot IFR operations No flight time limits for VFR operations
Commuters **704 Operators**	1,200 hours	300 hours	120 hours or 100 hours for flight crew members on call	40 hours if operating an aircraft other than a helicopter	8 hours for single-pilot IFR operations No flight time limits for VFR operations
Airlines **705 Operators**	1,200 hours	300 hours	120 hours or 100 hours for flight crew members on call	40 hours if operating an aircraft other than a helicopter	8 hours for single-pilot IFR operations No flight time limits for VFR operations
Helicopter operators	1,200 hours	300 hours	120 hours or 100 hours for flight crew members on call	60 hours	8 hours for single-pilot IFR operations No flight time limits for VFR operations

Appendix 2 – Maximum duty time (Canadian Aviation Regulations, s.700.16, Part VII, *Division III — Flight Time and Flight Duty Time Limitations and Rest Periods*)

	Maximum Duty Time		
	Within 24 hours	Within 7 days	Within 2 weeks
Canadian Aviation Regulations	14 hours	60 to 90 hours (depending on the type of operator), which result from the maximum flight time. allowed in the CARs	120 to 180 hours (depending on the type of operator), which result from the maximum flight time allowed in the CARs

Appendix 3 – Key Informant Profiles

Participant	Years of experience flying (at the time of the interview)	Qualifications	Flight experience (at the time of the interview)	Current employer (operator type)	Past employers (operator type)
Informant #1	8	• Airline transport pilot licence	3000 hours	• CARs subpart 705 operator (Airline) • Unionized pilot	CARs subpart 702 (Aerial work operator) & 703 (Air taxi operator)
Informant #2	18	• Commercial pilot licence • Flight instructor rating • Seaplane rating	1500 hours	• CARs subpart 703 operator (Air taxi operator) • Non-unionized pilot	Flight Training Unit as a Flight instructor
Informant #3	8	• Commercial pilot licence • Flight instructor rating	2300 hours	• CARs subpart 705 Operator (Airline) • Unionized pilot	• Flight Training Unit as a Flight instructor • CARs subpart 703 (Air taxi operator) & 704 (Commuter) operator)
Informant #4	20	• Airline transport pilot licence • Flight instructor rating	5600 hours	• CARs subpart 702 Operator (Aerial work operator) • Non-unionized pilot	Flight Training Unit as a Flight instructor
Informant #5	9	• Commercial pilot licence • Flight instructor rating	700 hours	• Flight Training Unit (Flight instructor) • Non-unionized pilot	N/A